RECENT TRENDS IN COMPUTATIONAL LOGICS AND INTELLIGENCE

BOOK CHAPTERS

Compiled By

DEPARTMENT OF COMPUTER SCIENCE, MATHS AND PHYSICS

@NILGIRI COLLEGE OF ARTS AND SCIENCE
(Affiliated to Bharathiar University)
UGC 2 (f) & 12 (B) Recognised, An ISO 9001:2015 Certified Institution)

@ Editor
Dr. Mohamed Sirajudeen, Associate Professor

@ Edition: Volume 1(June '2021 to December'2021)

CONTENTS

CHAPTER 1

ANALYSIS THE ROLE OF HUMAN FACTORS AND USABILITY INTERACTIONS IN COMPUTATIONAL LOGICS

Ranjith.K.V
Assistant Professor & Head
Department of Computer Science

1.0 Introduction

In 1996, the Human Factors and Ergonomics Society formed a new technical group, Cognitive Engineering and Decision Making. It became the largest technical group in the society. A decade earlier, this would have seemed an unlikely development: Senior human factors researchers disliked cognitive approaches, and it was in the CHI fields that cognitive engineering was being used in this sense (Norman, 1982; 1986). Even more astonishing would have been the fact that in 2005, human performance modelling would be a new, thriving technical group in HFES. The technical group was started by Wayne Gray and Dick Pew, both of whom participated in CHI in the 1980s. Human performance modelling was the Card, Moran, and Newell (1983) effort to reform the discipline of human factors from the outside.

Work had continued, focused on expert performance (e.g., a special issue of *HCI*, Vol. 12, Number 4, 1997). Today the reform effort is appropriately positioned within human factors, focused largely on nondiscretionary use. See Michael Byrne's chapter on cognitive architectures for more on this topic [1].

- ► Finally the HCI is defined as "it is a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them".

- ► Two components are needed in a human machine interface. The first is an input. A human user needs some way to tell the machine what to do, to make requests of the machine, or to adjust the machine. Examples of input devices include keyboards, toggles, switches, touch screens, joysticks, and mice. All of these devices can be utilized to send commands to a system or even an interlinked set of systems.

- ► The interface also requires an output, which allows the machine to keep the human user updated on the progress of commands, or to execute commands in physical

space. On a computer, for example, users have a screen which can display information.

1.1 Background:

It also known as human-machine interaction and perceptual-motor interaction in general, there are two basic theoretical and analytical frameworks as part of an integrated approach. In the first framework is the perceptual-motor interaction in the context of an information-processing model. In the second framework, it uses analytical tools that allow detailed investigations of both static and dynamic interactions[2].

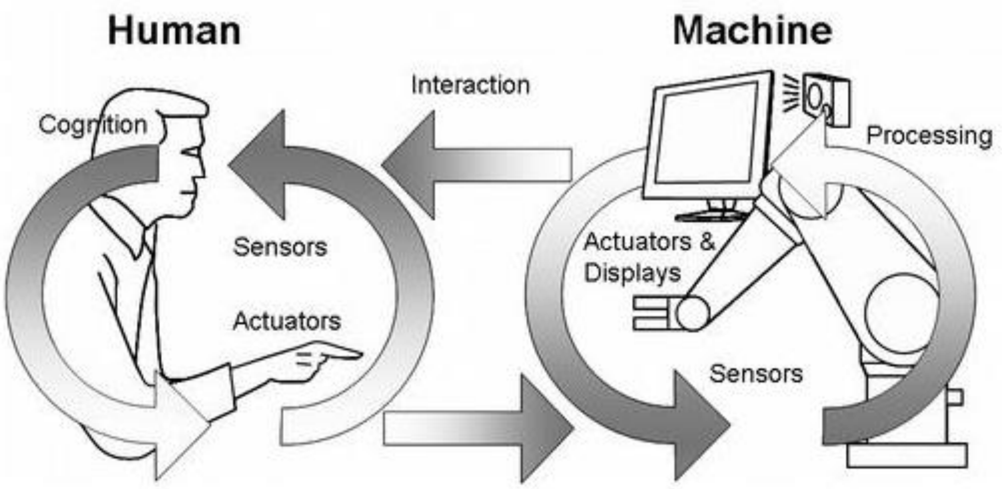


Fig 1.0 the way an human interact with computer

Until the late 1970s, the only humans who interacted with computers were information technology professionals and dedicated hobbyists. This changed disruptively with the emergence of personal computing around 1980. Personal computing, including both personal software (productivity applications, such as text editors and spreadsheets, and interactive computer games) and personal computer platforms (operating systems, programming languages, and hardware), made everyone in the developed world a potential computer user, and vividly highlighted the deficiencies of computers with respect to usability for those who wanted to use computers as tools[3][4]. The challenge of personal computing became manifest at an opportune time. The broad project of cognitive science, which incorporated cognitive psychology, artificial intelligence, linguistics, cognitive anthropology, and the philosophy of mind, had formed at the end of the 1970s. Part of the programme of cognitive

science was to articulate systematic and scientifically-informed applications to be known as "cognitive engineering". Thus, at just the point when personal computing presented the practical need for HCI, cognitive science presented people, concepts, skills, and a vision for addressing such needs. HCI was one of the first examples of cognitive engineering.

Other historically fortuitous developments contributed to establishment of HCI. Software engineering, mired in unmanageable software complexity in the 1970s, was starting to focus on nonfunctional requirements, including usability and maintainability, and on non-linear software development processes that relied heavily on testing. Computer graphics and information retrieval had emerged in the 1970s, and rapidly came to recognize that interactive systems were the key to progressing beyond early achievements. All these threads of development in computer science pointed to the same conclusion: The way forward for computing entailed understanding and better empowering users. Finally human factors engineering, which had developed many techniques for empirical analysis of human-system interactions in so-called control domains such as aviation and manufacturing, came to see HCI as a valuable and challenging domain in which human operators regularly exerted greater problem-solving discretion. These forces of need and opportunity converged around 1980, focusing a huge burst of human energy, and creating a highly visible interdisciplinary project[5].

1.2 Perception

- Perception is our awareness and understanding of the elements and objects of our environment through the physical sensation of our various senses, including sight, sound, smell, and so forth. Perception is influenced, in part, by experience.
- Other perceptual characteristics include the following:
  - Proximity. Our eyes and mind see objects as belonging together if they are near each other in space.
  - Similarity. Our eyes and mind see objects as belonging together if they share a common visual property, such as color, size, shape, brightness, or orientation.
  - Matching patterns. We respond similarly to the same shape in different sizes. The letters of the alphabet, for example, possess the same meaning, regardless of physical size.

- Succinctness. We see an object as having some perfect or simple shape because perfection or simplicity is easier to remember.
- Closure. Our perception is synthetic; it establishes meaningful wholes. If something does not quite close itself, such as a circle, square, triangle, or word, we see it as closed anyway.
- Unity. Objects that form closed shapes are perceived as a group.

1.3 Recommendations:

In Connection with the recent trends in computational logics , the following suggestions are recommended from study ;

- Balance. We desire stabilization or equilibrium in our viewing environment. Vertical, horizontal, and right angles are the most visually satisfying and easiest to look at.
- Expectancies. Perception is also influenced by expectancies; sometimes we perceive not what is there but what we expect to be there. Missing a spelling mistake in proofreading something we write is often an example of a perceptual expectancy error; we see not how a word is spelled, but how we expect to see it spelled.
- Context. Context, environment, and surroundings also influence individual perception. For example, two drawn lines of the same length may look the same length or different lengths, depending on the angle of adjacent lines or what other people have said about the size of the lines.
- Signals versus noise. Our sensing mechanisms are bombarded by many stimuli, some of which are important and some of which are not. Important stimuli are called signals; those that are not important or unwanted are called noise.

References:

1. Agarwal R, Anderson C, Crowley K, & Kannan PK (2011). Understanding development methods from other industries to improve the design of consumer health IT: Background report (Prepared by Westat, under Contract No. HHSA290200900023I.) AHRQ Publication No. 11–00650-EF. Rockville, MD: Agency for Healthcare Research and Quality. [Google Scholar]
2. Ancker JS, Witteman HO, Hafeez B, Provencher T, Van de Graaf M, & Wei E (2015). The invisible work of personal health information management among people with multiple chronic conditions: Qualitative interview study among patients and

providers. Journal of Medical Internet Research, 17(6), http://www.jmir.org/2015/2016/e2137/. [PMC free article] [PubMed] [Google Scholar]

3. Barry CA, Britten N, Barber N, Bradley C, & Stevenson F (1999). Using reflexivity to optimize teamwork in qualitative research. Qualitative Health Research, 9, 26–44. [PubMed] [Google Scholar]
4. Brooke J (1996). SUS-A quick and dirty usability scale. Usability evaluation in industry, 189(194), 4–7. [Google Scholar]
5. Carayon P, Karsh B, Gurses AP, Holden RJ, Hoonakker P, Hundt AS, … Wetterneck TB (2013). Macroergonomics in healthcare quality and patient safety. Reviews of Human Factors and Ergonomics, 8, 4–54. [PMC free article] [PubMed] [Google Scholar]

CHAPTER 2

ROLE OF MEMORY IN COMPUTATIONAL INTELLIGENCE FOR HUMAN-MACHINE INTERACTIONS –AN OVERVIEW

Dr.M.Mohamed Sirajudeen

Assistant Professor in Computer Science

2.0 Introduction

Memory is viewed as consisting of two components, long-term and short-term (or working) memory. Short-term, or working, memory receives information from either the senses or long-term memory, but usually cannot receive both at once, the senses being processed separately. Within short-term memory a limited amount of information processing takes place. Information stored within it is variously thought to last from 10 to 30 seconds, with the lower number being the most reasonable speculation. Knowledge, experience, and familiarity govern the size and complexity of the information that can be remembered [1].

Long-term memory contains the knowledge we possess. Information received in short-term memory is transferred to it and encoded within it, a process we call learning. It is a complex process requiring some effort on our part. The learning process is improved if the information being transferred from short-term memory has structure and is meaningful and familiar. Learning is also improved through repetition. Unlike short-term memory, with its distinct limitations, long-term memory capacity is thought to be unlimited. An important memory consideration, with significant implications for interface design, is the difference in ability to recognize or recall words [2].

2.1 Background Information: Sensory Storage

Sensory storage is the buffer where the automatic processing of information collected from our senses takes place. It is an unconscious process, large, attentive to the environment, quick to detect changes, and constantly being replaced by newly gathered stimuli. In a sense, it acts like radar, constantly scanning the environment for things that are important to pass on to higher memory [3].

Repeated and excessive stimulation can fatigue the sensory storage mechanism, making it less attentive and unable to distinguish what is important (called habituation). Avoid unnecessarily stressing it. Design the interface so that all aspects and elements serve a definite purpose [4][5]. Eliminating interface noise will ensure that important things will be less likely to be missed.

Visual Acuity

- The capacity of the eye to resolve details is called visual acuity. It is the phenomenon that results in an object becoming more distinct as we turn our eyes toward it and rapidly losing distinctness as we turn our eyes away—that is, as the visual angle from the point of fixation increases.
- It has been shown that relative visual acuity is approximately halved at a distance of 2.5 degrees from the point of eye fixation
- The eye's sensitivity increases for those characters closest to the fixation point (the "0") and decreases for those characters at the extreme edges of the circle (a 50/50 chance exists for getting these characters correctly identified). This may be presumed to be a visual "chunk" of a screen

Foveal and Peripheral Vision

- Foveal vision is used to focus directly on something; peripheral vision senses anything in the area surrounding the location we are looking at, but what is there cannot be clearly resolved because of the limitations in visual acuity just described.
- Foveal and peripheral vision maintain, at the same time, a cooperative and a competitive relationship. Peripheral vision can aid a visual search, but can also be distracting.
- In its cooperative nature, peripheral vision is thought to provide clues to where the eye should go next in the visual search of a screen.
- In its competitive nature, peripheral vision can compete with foveal vision for attention. What is sensed in the periphery is passed on to our information-processing system along with what is actively being viewed foveally.

2.2 Information Processing

- The information that our senses collect that is deemed important enough to do something about then has to be processed in some meaningful way.
- There are two levels of information processing going on within us. One level, the highest level, is identified with consciousness and working memory. It is limited, slow, and sequential, and is used for reading and understanding.
- In addition to this higher level, there exists a lower level of information processing, and the limit of its capacity is unknown. This lower level processes familiar information rapidly, in parallel with the higher level, and without conscious effort.
- Both levels function simultaneously, the higher level performing reasoning and problem solving, the lower level perceiving the physical form of information sensed.

Mental Models

- A mental model is simply an internal representation of a person's current understanding of something. Usually a person cannot describe this mental mode and most often is unaware it even exists.
- Mental models are gradually developed in order to understand something, explain things, make decisions, do something, or interact with another person. Mental models also enable a person to predict the actions necessary to do things if the action has been forgotten or has not yet been encountered.
- A person already familiar with one computer system will bring to another system a **mental model** containing specific visual and usage expectations. If the new system complies with already-established models, it will be much easier to learn and use.
- The key to forming a transferable mental model of a system is design consistency and design standards.

Movement Control

- Particularly important in screen design is Fitts' Law (1954). This law states that:
- The time to acquire a target is a function of the distance to and size of the target.
- This simply means that the bigger the target is, or the closer the target is, the faster it will be reached. The implications in screen design are:
    - ✓ Provide large objects for important functions.

- ✓ Take advantage of the “pinning” actions of the sides, top, bottom, and corners of the screen.

2.3 Recommendations

Gould (1988) suggests using the following kinds of techniques to gain an understanding of users, their tasks and needs, the organization where they work, and the environment where the system may be used.

- Visit user locations, particularly if they are unfamiliar to you, to gain an understanding of the user’s work environment.
- Talk with users about their problems, difficulties, wishes, and what works well now. Establish direct contact; avoid relying on intermediaries.
- Observe users working or performing a task to see what they do, their difficulties, and their problems.
- Videotape users working or performing a task to illustrate and study problems and difficulties.
- Learn about the work organization where the system may be installed.
- Have users think aloud as they do something to uncover details that may not otherwise be solicited.
- Try the job yourself. It may expose difficulties that are not known, or expressed, by users.
- Prepare surveys and questionnaires to obtain a larger sample of user opinions.
- Establish testable behavioural target goals to give management a measure for what progress has been made and what is still required.

References

1. T. M. Wang, Y. Tao and H. Liu, Current researches and future development trend of intelligent robot: A review, International Journal of Automation and Computing 15(5) (2018) 525–546.

2. A. H. Abdelaziz, Comparing fusion models for DNN-based audiovisual continuous speech recognition, IEEE/ACM Transactions on Audio, Speech and Language Processing (TASLP) 26(3) (2018) 475–484.

3. S. Ren, K. He, R. Girshick, X. Zhang and J. Sun, Object detection networks on convolutional feature maps, IEEE Transactions on Pattern Analysis and Machine Intelligence 39(7) (2017) 1476–1481.

4. T. Young, D. Hazarika, S. Poria and E. Cambria, Recent trends in deep learning based natural language processing, IEEE Computational Intelligence Magazine, 13(3) (2018) 55–75.

5. K. Tirri and P. Nokelainen, Measuring Multiple Intelligences and Moral Sensitivities in Education (SensePublishers, 2011)

CHAPTER 3

FEATURES BASED ANALYSIS FOR INTERFACE CREATION IN COMPUTATIONAL INTELLIGENCE – OVERVIEW

Ms. Sasikala
Assistant Professor & Deputy Head
Department of Computer Science

3.1 Introduction

The complexity of a graphical or Web interface will always magnify any problems that do occur. Pitfalls can be eliminated if the following design commandments remain foremost in the designer's mind. Gain a complete understanding of users and their tasks: The users are the customers. Today, people expect a level of design sophistication from all interfaces, including Web sites. The product, system or Web site must be geared to people's needs, not those of the developers. Solicit early and ongoing user involvement: Involving the users in design from the beginning provides a direct conduit to the knowledge they possess about jobs, tasks, and needs [1].

Involvement also allows the developer to confront a person's resistance to change, a common human trait. People dislike change for a variety of reasons, among them fear of the unknown and lack of identification with the system. Perform rapid prototyping and testing: Prototyping and testing the product will quickly identify problems and allow you to develop solutions. Prototyping and testing must be continually performed during all stages of development to uncover all potential defects. If thorough testing is not performed before product release, the testing will occur in the user's office. Encountering a series of problems early in system use will create a negative first impression in the customer's mind, and this may harden quickly, creating attitudes that may be difficult to change. It is also much harder and more costly to fix a product after its release. Modify and iterate the design as much as necessary: While design will proceed through a series of stages, problems detected in one stage may force the developer to revisit a previous stage [2].

Establish user performance and acceptance criteria and continue testing and modifying until all design goals are met. Integrate the design of all the system components: The software, the documentation, the help function, and training needs are all important elements of a graphical

system or Web site and all should be developed concurrently. Time will also exist for design trade-offs to be thought out more carefully [3] [4] [5].

3.2 Objects- Action Interface Model

When interacting with a computer, a person,

- ✓ Identifies a task to be performed or need to be fulfilled: The task may be very structured or semi structured or structured with free form activities.
- ✓ Decides how the task will be completed or the need fulfilled: set of transaction screens will be used. The proper transaction is identified and the relevant screen series retrieved.
- ✓ Manipulates the computer's controls: To perform the task or satisfy the need, the keyboard, mouse, and other similar devices are used
- ✓ Gathers the necessary data: Screens information is collected from its source through forms or co-worker and placed on the screen, through control manipulation. Forms judgments resulting in decisions relevant to the task or need: Structured transactions will require minimal decision-making. Semi-structured transactions, in addition, may require decisions such as: Which set of screens, from all available items.
- ✓ To make an interface easy and pleasant to use, then, the goal in design is to:
    - Reduce visual work.
    - Reduce intellectual work.
    - Reduce memory work.
    - Reduce motor work.
    - Minimize or eliminate any burdens or instructions imposed by technology.

3.3 Golden Rules for Designing Interface

Importance of Good Design

- In spite of today's rich technologies and tools we are unable to provide effective and usable screen because lack of time and care.

- A well-designed interface and screen is terribly important to our users. It is their window to view the capabilities of the system and it is also the vehicle through which complex tasks can be performed.
- A screen’s layout and appearance affect a person in a variety of ways. If they are confusing and inefficient, people will have greater difficulty in doing their jobs and will make more mistakes.
- Poor design may even chase some people away from a system permanently. It can also lead to aggravation, frustration, and increased stress.

Benefits of Good Design

- The benefits of a well-designed screen have also been under experimental scrutiny for many years. One researcher, for example, attempted to improve screen clarity and readability by making screens less crowded. The result: screen users of the modified screens completed transactions in 25 percent less time and with 25 percent fewer errors than those who used the original screens.
- Another researcher has reported that reformatting inquiry screens following good design principles reduced decision-making time by about 40 percent, resulting in a savings of 79 person-years in the affected system.
- Other benefits also accrue from good design (Karat, 1997). Training costs are lowered because training time is reduced, support line costs are lowered because fewer assist calls are necessary, and employee satisfaction is increased because aggravation and frustration are reduced.
- Another benefit is, ultimately, that an organization’s customers benefit because of the improved service they receive.
- Identifying and resolving problems during the design and development process also has significant economic benefits.

Golden Rules

The design goals in creating a user interface are described below. They are fundamental to the design and implementation of all effective interfaces, including GUI and Web ones. These principles are general characteristics of the interface, and they apply to all aspects.

- Aesthetically Pleasing

        - Provide visual appeal by following these presentation and graphic design principles:
            - Provide meaningful contrast between screen elements.
            - Create groupings.
            - Align screen elements and groups.
            - Provide three-dimensional representation.
            - Use color and graphics effectively and simply.
- Clarity
    - The interface should be visually, conceptually, and linguistically clear, including:
        - Visual elements
        - Functions
        - Metaphors
        - Words and text
- Compatibility
    - Provide compatibility with the following:
        - The user
        - The task and job
        - The product
    - Adopt the user's perspective.
- Comprehensibility
    - A system should be easily learned and understood. A user should know the following:
        - What to look at
        - What to do
        - When to do it
        - Where to do it
        - Why to do it
        - How to do it
    - The flow of actions, responses, visual presentations, and information should be in a sensible order that is easy to recollect and place in context.
- Configurability
    - Permit easy personalization, configuration, and reconfiguration of settings.

        - Enhances a sense of control.
        - Encourages an active role in understanding.
- Consistency
    - A system should look, act, and operate the same throughout. Similar components should:
        - Have a similar look.
        - Have similar uses.
        - Operate similarly.

3.4 Recommendations

The following recommendations are bring out from a feature based analysis;

- The function of elements should not change.
- The position of standard elements should not change.
- In addition to increased learning requirements, inconsistency in design has a number of other prerequisites and by-products, including:
- More specialization by system users.
- Greater demand for higher skills.
- More preparation time and less production time.
- More frequent changes in procedures.
- More error-tolerant systems (because errors are more likely).
- More kinds of documentation.
- More time to find information in documents.
- More unlearning and learning when systems are changed.
- More demands on supervisors and managers.
- More things to do wrong.

References

1. Lasseter, R.H. Microgrids. In Proceedings of the Power Engineering Society Winter Meeting, New York, NY, USA, 27–31 January 2002; IEEE: Piscataway, NJ, USA, 2002; pp. 305–308.

2. Nejabatkhah, F.; Li, Y.W. Overview of power management strategies of hybrid AC/DC microgrid. IEEE Trans. Power Electron. 2015, 30, 7072–7089. [CrossRef]

3. Zeng, Z.; Yang, H.; Zhao, R.; Cheng, C. Topologies and control strategies of multi-functional grid-connected inverters for power quality enhancement: A comprehensive review. Renew. Sustain. Energy Rev. 2013, 24, 223–270. [CrossRef]

4. Jumani, T.A.; Mustafa, M.W.; Rasid, M.M.; Mirjat, N.H.; Baloch, M.H.; Salisu, S. Optimal Power Flow Controller for Grid-Connected Microgrids using Grasshopper Optimization Algorithm. Electronics 2019, 8, 111. [CrossRef]

5. Al-Saedi, W.; Lachowicz, S.W.; Habibi, D.; Bass, O. Power quality enhancement in autonomous microgrid operation using particle swarm optimization. Int. J. Electr. Power Energy Syst. 2012, 42, 139–149. [CrossRef]

CHAPTER 4

A STUDY FOR USABILITY TEST IN THE COMPUTATIONAL LOGICS FOR HUMAN –MACHINE INTERACTIONS

Ms. Archana
Assistant Professor in Department of Computer Science

4.0 Introduction

The following kinds of knowledge and experiences should be identified;

- **Computer Literacy**

  Are the users highly technical such as programmers or experienced data entry clerks or vice versa?

- **Novice Vs Experts**

  Words to describe the new, relatively new, or infrequent user have included naive, casual, **inexperienced, or novice**. At the other end of the experience continuum lie terms such as experienced, full-time, frequent, power, or expert. In between these extremes is a wide range of intermediate or intermittent users. In business systems, novice users have been found to: Depend on system features that assist recognition memory: menus, prompting information, and instructional and help screens.
- Need restricted vocabularies, simple tasks, small numbers of possibilities, and very informative feedback. View practice as an aid to moving up to expert status.
  - Experts, on the other hand:
- Rely upon free recall.
- Expect rapid performance.
- Need less informative feedback.
- Seek efficiency by bypassing novice memory aids, reducing keystrokes, chunking and summarizing
  - Novice users often have difficulties:
- Dragging and double-clicking using the mouse. Distinguishing between double-clicks and two separate clicks is particularly confusing

- In window management. That overlapping windows represent a three-dimensional space is not always realized. Hidden windows are assumed to be gone and no longer exist.
- In file management. The organization of files and folders nested more than two levels deep is difficult to understand. Structure is not as apparent as with physical files and folders.

4.1 Usability: An Expert session Perception

Experts possess the following traits:

- They possess an integrated conceptual model of a system.
- They possess knowledge that is ordered more abstractly and more procedurally.
- They organize information more meaningfully, orienting it toward their task.
- They structure information into more categories.
- They are better at making inferences and relating new knowledge to their objectives and goals.
- They pay less attention to low-level details.
- They pay less attention to surface features of a system.
    - Novices exhibit these characteristics:
- They possess a fragmented conceptual model of a system.
- They organize information less meaningfully, orienting it toward surface features of the system.
- They structure information into fewer categories.
- They have difficulty in generating inferences and relating new knowledge to their objectives and goals.
- They pay more attention to low-level details.
- They pay more attention to surface features of the system.

Application Experience

- Have users worked with a similar application (for example, word processing, airline reservation, and so on)? Are they familiar with the basic application terms? Or does little or no application experience exist?

Task Experience

- Are users experienced with the task being automated? Or do users possess little or no knowledge of the tasks the system will be performing?

Other System Use

- Will the user be using other systems while using the new system?

Education

- What is the general educational level of users? Do they generally have high school degrees, college degrees, or advanced degrees?

Reading Level

- For textual portions of the interface, the vocabulary and grammatical structure must be at a level that is easily understood by the users.

Typing Skill

- Is the user a competent typist or of the hunt-and-peck variety? Is he or she familiar with the standard keyboard layout or other newer layouts?

Native Language and Culture

- Do the users speak English, another language, or several other languages? Will the screens be in English or in another language? Other languages often impose different screen layout requirements.
- Are there cultural or ethnic differences between users?

4.2 The User's Tasks and Needs to meet Usability :

- The user's tasks and needs are also important in design. The following should be determined: Mandatory Vs Discretionary Use
  - Users of the earliest computer systems were mandatory or nondiscretionary. That is, they required the computer to perform a task that, for all practical purposes, could be performed no other way.
  - This newer kind of user is the office executive, manager, or other professional, whose computer use is completely discretionary.

Characteristics of mandatory use can be summarized as follows:

- The computer is used as part of employment.
- Time and effort in learning to use the computer are willingly invested.
- High motivation is often used to overcome low usability characteristics.
- The user may possess a technical background.

- The job may consist of a single task or function.

Common general characteristics of the discretionary user are as follows:

- Use of the computer or system is not absolutely necessary.
- Technical details are of no interest.
- Extra effort to use the system may not be invested.
- High motivation to use the system may not be exhibited.
- May be easily disenchanted.
- Voluntary use may have to be encouraged.
- Is from a heterogeneous culture.

Frequency of Use

- Is system use a continual, frequent, occasional, or once-in-a-lifetime experience? **Frequency of use affects both learning and memory.**
- Occasional or infrequent users prefer ease of learning and remembering,

Task or Need Importance

- How important is the task or need for the user?
- People are usually willing to spend more time learning something if it makes the task being performed or need being fulfilled more efficient.

Task Structure

- How structured is the task being performed? Is it repetitive and predictable or not so?

Social Interactions

- Will the user, in the normal course of task performance, be engaged in a conversation with another person, such as a customer, while using the system? If so, design should not interfere with the social interaction.
- Neither the user nor the person to whom the user is talking must be distracted in any way by computer interaction requirements. The design must accommodate the social interaction.

4.3 The User's Psychological Characteristics

- A person's psychological characteristics also affect one's performance of tasks requiring motor, cognitive, or perceptual skills.

Attitude and Motivation

- Is the user's attitude toward the system positive, neutral, or negative? Is motivation high, moderate, or low?
- While all these feelings are not caused by, and cannot be controlled by, the designer, a positive attitude and motivation allows the user to concentrate on the productivity qualities of the system.

Patience

- Is the user patient or impatient?
- They are exhibiting less tolerance for Web use learning requirements, slow response times, and inefficiencies in navigation and locating desired content.

Stress Level

- Will the user be subject to high levels of stress while using the system? Interacting with an angry boss, client, or customer, can greatly increase a person's stress level.
- System navigation or screen content may have to be redesigned for extreme simplicity in situations that can become stressful.

Expectations

- What are user's expectations about the system or Web site? Are they realistic?
- Is it important that the user's expectations be realized?

4.4 Conclusion

People differ in how they think about and solve problems. Some people are better at verbal thinking, working more effectively with words and equations. Others are better at spatial reasoning—manipulating symbols, pictures, and images. Some people are analytic thinkers, systematically analyzing the facets of a problem. Others are intuitive, relying on rules of thumb, hunches, and educated guesses. Some people are more concrete in their thinking, others more abstract.

References

Acknowledgements The HCI&IM CG Co-Chairs thank the many participants and contributors to the HCI&IM workshop and to this report. The Co-Chairs especially thank Dr. Helen M. Gigley who made major contributions to the organization of the workshop and to the content of this report while serving since 2000 as the NCO/ITR&D's liaison to the HCI&IM CG. Dr. Gigley's expertise and insights were essential to making this report possible.

CHAPTER 5

COMPREHENSIVE ANALYSIS FOR USABILITY TESTING MECHANISM IN COMPUTATIONAL LOGICS

Mr.Michael Raj
Assistant Professor in Computer Science

5.0 Introduction: User's Physical Characteristics :

- The physical characteristics of people can also greatly affect their performance with a system.

Age

- Are the users children, young adults, middle-aged, senior citizens, or very elderly? Age can have an affect on both computer and system usage.

Young Adults VS Older Adults

Young adults (aged 18–36), in comparison to older adults (aged 64–81)

- Use computers and ATMs more often.
- Read faster.
- Possess greater reading comprehension and working memory capacity.
- Possess faster choice reaction times.
- Possess higher perceptual speed scores.
- Complete a search task at a higher success rate.
- Use significantly less moves (clicks) to complete a search task.
- Are more likely to read a screen a line at a time.

Older adults, as compared to young adults:

- Are more educated.
- Possess higher vocabulary scores.

- Have more difficulty recalling previous moves and location of previously viewed information.
- Have more problems with tasks that require three or more moves (clicks).
- Are more likely to scroll a page at a time
- Respond better to full pages rather than long continuous scrolled pages.

Methods for Gaining an Understanding of Users [Mika 2003]

- Visit user locations, particularly if they are unfamiliar to you, to gain an understanding of the user's work environment.
- Talk with users about their problems, difficulties, wishes, and what works well now. Establish direct contact; avoid relying on intermediaries.
- Observe users working or performing a task to see what they do, their difficulties, and their problems.
- Videotape users working or performing a task to illustrate and study problems and difficulties.
- Learn about the work organization where the system may be installed.
- Have users think aloud as they do something to uncover details that may not otherwise be solicited.
- Try the job yourself. It may expose difficulties that are not known, or expressed, by users.
- Prepare surveys and questionnaires to obtain a larger sample of user opinions.
- Establish testable behavioural target goals to give management a measure for what progress has been made and what is still required [Monarch 2005].
-

5.1 Background Information about Users Physical Characteristics:

Hearing

- As people age, they require louder sounds to hear, a noticeable attribute in almost any everyday activity.

Age in Years	Sound Level in dB
25	57
45	65

65	74
85	85

Vision

- Older adults read prose text in smaller type fonts more slowly than younger adults
- (Charness and Dijkstra, 1999). For older adults they recommend:
    - 14-point type in 4-inch wide columns.
    - 12-point type in 3-inch wide columns.
- Ellis and Kurniawan (2000) recommend the following fonts for older users:
    - San serif (Arial, Helvetica, and Verdana).
    - Black type on a white background.
- Ellis and Kurniawan (2000) and Czaja (1997) suggest Web links should be:
    - Distinct and easy to see.
    - Large (at least 180 × 22 pixels for a button).
    - Surrounded by a large amount of white space.

Cognitive Processing

- Brain processing also appears to slow with age. Working memory, attention capacity, and visual search appear to be degraded.
- Tasks where knowledge is important show the smallest age effect and tasks dependent upon speed show the largest effect [Morris 2004]

Gender

- A user's gender may have an impact on both motor and cognitive performance because
    - Women are not as strong as men,
    - Women also have smaller hands than men, and
    - Significantly more men are color-blind than women

Handedness

- A user’s handedness, left or right, can affect ease of use of an input mechanism, depending on whether it has been optimized for one or the other hand.

Disabilities

- Blindness, defective vision, color-blindness, poor hearing, deafness, and motor handicaps can affect performance on a system not designed with these disabilities in mind.
- People with special needs must be considered in design especially for systems like web design.

5.2 Usability Testing:

- Users at work are observed, evaluated, and measured in a specially constructed laboratory to establish the usability of the product at that point in time.
- **Usability tests uncover what people actually do, not what they think they do a common problem with verbal descriptions**
- The same scenarios can be presented to multiple users, providing comparative data from several users.

Card Sorting for Web Sites

- A technique to establish groupings of information for Web sites.
- Briefly, the process is as follows:
  - From previous analyses, identify about 50 content topics and inscribe them on index cards. Limit topics to no more than 100.
  - Provide blank index cards for names of additional topics the participant may want to add, and colored blank cards for groupings that the participant will be asked to create.
  - Number the cards on the back.

- Arrange for a facility with large enough table for spreading out cards.
- Select participants representing a range of users. Use one or two people at a time and 5 to 12 in total.
- Explain the process to the participants, saying that you are trying to determine what categories of information will be useful, what groupings make sense, and what the groupings should be called.
- Ask the participants to sort the cards and talk out loud while doing so. Advise the participants that additional content cards may be named and added as they think necessary during the sorting process.
- Observe and take notes as the participants talk about what they are doing. Pay particular attention to the sorting rationale.
- Upon finishing the sorting, if a participant has too many groupings ask that they be arranged hierarchically.
- Ask participants to provide a name for each grouping on the colored blank cards, using words that the user would expect to see that would lead them to that particular grouping.
- Make a record of the groupings using the numbers on the back of each card.
- Reshuffle the cards for the next session.
- When finished, analyze the results looking for commonalities among the different sorting sessions.

Indirect Methods

- An indirect method of requirements determination is one that places an intermediary between the developer and the user. This intermediary may be electronic or another person

Problems of Indirect Method

- First, there may be a filtering or distortion of the message, either intentional or unintentional.
- Next, the intermediary may not possess a complete, or current, understanding of user’s needs, passing on an incomplete or incorrect message.

- Finally, the intermediary may be a mechanism that discourages direct user-developer contact for political reasons.

MIS Intermediary

- A company representative defines the user's goals and needs to designers and developers.
- This representative may come from the Information Services department itself, or he or she may be from the using department.

Paper Survey or Questionnaire

- A survey or questionnaire is administered to a sample of users using traditional mail methods to obtain their needs.
- **Advantage**
    - Questionnaires have the potential to be used for a large target audience located most anywhere, and are much cheaper than customer visits.
    - They generally, however, have a low return rate
- **Disadvantage**
    - They may take a long time to collect and may be difficult to analyze.
- **Questionnaires should be composed mostly of closed questions**
- Questionnaires should be relatively short and created by someone experienced in their design.

Electronic Survey or Questionnaire

- A survey or questionnaire is administered to a sample of users using e-mail or the Web to obtain their needs.
- In creating an electronic survey:
    - Determine the survey objectives.
    - Determine where you will find the people to complete the survey.
    - Create a mix of multiple choice and open-ended questions requiring short answers addressing the survey objectives.
    - Keep it short, about 10 items or less is preferable.
    - Keep it simple, requiring no more than 5–10 minutes to complete

- **Iterative survey**
    - Consider a follow-up more detailed survey, or surveys, called *iterative surveys*. Ask people who complete and return the initial survey if they are willing to answer more detailed questions. If so, create and send the more detailed survey.
    - A third follow-up survey can also be designed to gather additional information about the most important requirements and tasks
    - Iterative surveys, of course, take a longer time to complete.

5.3 Conclusion

- A small group of users and a moderator discuss the requirements online using workstations.
- advantages
    - advantages of electronic focus groups over traditional focus groups are that the discussion is less influenced by group dynamics; has a smaller chance of being dominated by one or a few participants; can be anonymous, leading to more honest comments and less caution in proposing new ideas
- **Disadvantages**
    - The depth and richness of verbal discussions does not exist and the communication enhancement aspects of seeing participant's body language are missing.

References

[Mika 2003] Peter Mika, Victor Iosif, York Sure, & Hans Akkermans, Handbook on Ontologies. New York: Springer, 2004 (ISBN: 3540408347), pages 455-476. Springer, 2003. http://www.aifb.unikarlsruhe.de/WBS/ysu/publications/2003_ontohandbook_ens.pdf

[Monarch 2008] Ira Monarch, Dennis Goldenson, Peter Capell, and Jim Wessel. "Tailoring and Combining the CMMI-ACQ and Quality Models to Improve the Military's Requirements Process." SEPG North America. Tampa, Florida, March 2008. http://www.sei.cmu.edu/sema/presentations /monarch-acq.pdf

[Monarch 2005] Ira A. Monarch & Dennis R. Goldenson. "Categorizing Measurement & Analysis Needs in Software & Systems Engineering." 9th Annual Practical Software and Systems Measurement Users' Group Conference. Keystone, Colorado, July 2005.

[Monarch 1995] Ira A. Monarch. An Experiment in Software Development Risk Information Analysis, CMU/SEI95-TR-014, ADA302320. Software Engineering Institute, Carnegie Mellon University, 1995. http://www.sei.cmu.edu/pub/documents/95.reports/pdf/tr014.95.pdf

[Morris 2004] Edwin J. Morris, Linda Levine, Craig Meyers, Patrick Place, & Dan Plakosh. Systems of Systems Interoperability, CMU/SEI-2004-TR-004, ADA455619. Software Engineering Institute, Carnegie Mellon University, 2004. http://www.sei.cmu.edu/pub/documents/04.reports/pdf/04tr004.pdf

CHAPTER 6

ENHANCEMENT OF USER'S INTERACTIVE MODE IN COMPUTATIONAL LOGICS – AN ANALYSIS

Mr.Muthukumar
Assistant Professor in Computer Science

6.0 Introduction: Interactive Modes:

The way to interact with the system by human is generally discussed as follows,

Images

- ✓ Use appropriate alternative text for images.
- ✓ Alternative text is also used by text-only browsers, display less devices such as mobile phone browsers, and by search engines.

Image Maps

- ✓ Use client-side image maps and alternative text for image map hot spots.
- ✓ If a server-side map is needed, provide equivalent text links.
- ✓ Server-side image maps are currently not accessible to anyone using non graphical browsers or browsers with images turned off.
- ✓ Client-side image maps are accessible when the alternative text is supplied for each area of the image map [1].
- ✓ Provide alternative text for the image map itself as well.

6.1 Components of Interactive Modes:

Graphs and charts

- ✓ Summarise the content of each graph and chart, or use the longdesc attribute to link to the description or data [2] [3].
- ✓ The amount of alternative information to provide depends on the contextual use of the chart or graph, but generally it should include all the information available to the sighted user.

Multimedia

- ✓ Provide captions or transcripts of important audio content. Provide audio descriptions of important video content [4] [5].

Scripts

- ✓ Ensure the functionality of scripts is accessible via the keyboard. If the content affected by scripting is not accessible, provide an alternative.

- ✓ If the essential tasks can be accomplished with scripting turned off, then the scripting does not need to be directly accessible.

Non-HTML content

- ✓ When an applet, plug-in or other application needs to be present, provide a link to one that is directly accessible or provide alternate content.

Forms

- ✓ Make forms accessible to assistive technologies.
- ✓ Labels must be explicitly associated with the FORM elements through HTML mark-up.

Skip to main content

- ✓ Provide methods for skipping over navigation links to get to the main content of a page.

Frames

- ✓ Provide a title for each frame element and frame page. Provide an accessible source for each frame.
- ✓ People who use text browsers or assistive technologies must choose which frame to open when they visit a frameset page.

- ✓ If the source of the frame is an image file there is no opportunity to add the alt attribute to the image.

Table Headers

- ✓ Use the th element to mark up the table heading cells. Use the headers attribute on complex databases.

Cascading Style Sheets

- ✓ Web pages should be readable without requiring style sheets.
- ✓ CSS describes how elements in a web page are *presented*, not how the page is structured. Structure refers to, for example, what is a heading, what is content, what is tabular data.
- ✓ Use CSS, not tables, for web page layout because nested tables are interpreted by screen readers as displaying data.
- ✓ Not all browsers and assistive technologies support CSS well.

6.2 Functional Elements:

Keyboard equivalents

- ✓ Provide keyboard equivalents for all actions. Users who are unable to use the mouse need all functions to be available via the keyboard.

Built-in accessibility

- ✓ Do not interfere with keyboard accessibility features built into the operating system. Many operating systems have a set of accessibility options that enable users with disabilities to customise system-wide settings to improve accessibility.

Focus.

- ✓ Provide a visual focus indicator that moves among interactive objects as the focus changes. This indicator must be programmatically exposed to assistive technology.

Assistive technology needs to know the position and contents of the visual focus indicator so it can appropriately convey that information to the user.

User Interface Objects

- ✓ Provide semantic information about user interface objects. When an image represents a program element, the information conveyed by the image must also be available in the text. Assistive technology will then be able to convey the identity of the focus object as well as its role and state to the user.

Labels

- ✓ Associate labels with controls, objects, icons and images. If an image is used to identify programmatic elements, the meaning of the image must be consistent throughout the application.

Forms

- ✓ When electronic forms are used, the form should allow people with assistive technology to access the information, field elements and functionality needed to complete and submit the form, including all directions and cues. Accessibility of the form depends on proper coding of the controls so the information is exposed to screen readers.

Sound and Multimedia

Audio alerts

- ✓ Provide an option to display a visual cue for all audio alerts.

Significant audio and video

- ✓ Provide accessible alternatives to significant audio and video. Alternatives are also needed for those with hardware or environmental limitations.

Volume

- ✓ Provide an option to adjust the volume.

Display Text

- ✓ Provide text through standard system functions calls or through an API that supports interaction with assistive technology. Screen readers use an Off-screen Model (OSM) to get information such as text content, text input caret location, and text attributes. If text is displayed in a non-standard way, the screen reader will not be able to read the information to the user.

Display Colour

- ✓ Use colour as an enhancement, not as the only way to convey information or indicate an action.

Display Contrast

- ✓ Support system settings for high contrast for all user interface controls and client area content.

Display Customisation

- ✓ When colour customisation is supported, provide a variety of colour selections capable of producing a range of contrast levels.

Display System settings

- ✓ Inherit system settings for font, size and colour for all user interface controls.

Display Animation

- ✓ Provide an option to display animation in a non-animated presentation mode.

6.3 Conclusion:

Provide an option to adjust the response times on timed instructions, or allow the instructions to persist. When a timed response is needed, alert the user and give sufficient time to indicate more time is required. Some users have difficulty reading or responding to information if it is

displayed briefly or requires a quick response time. Some response delays may also be caused by assistive technologies

References

1. Jumani, T.A.; Mustafa, M.; Rasid, M.M.; Anjum, W.; Ayub, S. Salp Swarm Optimization Algorithm-Based Controller for Dynamic Response and Power Quality Enhancement of an Islanded Microgrid. Processes 2019, 7, 840. [CrossRef]

2. Colson, C.M.; Nehrir, M.H.; Pourmousavi, S.A. Towards real-time microgrid power management using computational intelligence methods. In Proceedings of the IEEE PES General Meeting, Detroit, MI, USA, 24–29 July 2011; IEEE: Piscataway, NJ, USA, 2002; pp. 1–8.

3. Laghari, J.; Mokhlis, H.; Bakar, A.; Mohamad, H. Application of computational intelligence techniques for load shedding in power systems: A review. Energy Convers. Manag. 2013, 75, 130–140. [CrossRef]

4. Das, D.C.; Roy, A.; Sinha, N. GA based frequency controller for solar thermal–diesel–wind hybrid energy generation/energy storage system. Int. J. Electr. Power Energy Syst. 2012, 43, 262–279. [CrossRef]

5. Ngamroo, I. Application of electrolyzer to alleviate power fluctuation in a stand alone microgrid based on an optimal fuzzy PID control. Int. J. Electr. Power Energy Syst. 2012, 43, 969–976. [CrossRef]

CHAPTER 7

SENSOR BASED ELEMENTS IN INTERACTIVE DEVICES FOR COMPUTATIONAL INTELLIGENCE – AN OVERVIEW

Mr.Bibin Baby
Assistant Professor in Computer Science

7.0 Introduction: Interactive Devices:

Many people with disabilities need devices to help them render content. These devices may be referred to as access systems, assistive technology, adaptive technology and adaptive computing (Paciello 2000). However, these are expensive to buy and maintain.

7.1 Background Information:

Output Devices

- Screen readers and voice browsers are software applications that are combined with text-to-speech synthesizers to locate and read aloud the information on a computer screen to users who are blind, and are also useful to those with learning disabilities (Paciello 2000). They usually work closely with the operating system and rely on the system’s built-in capabilities, so applications that override system settings can be unusable for some people (NCAM 2003b).

- Screen magnifiers are used to increase the size of text or images on a computer screen, and may also allow users to change the default colours of the display. They usually do this by tracking the active region of the screen, indicated by the cursor, and automatically enlarge that portion of the screen. Using custom cursors may result in a compatibility issue, with the magnifier enlarging the wrong portion of the screen (NCAM 2003b).

- Refreshable Braille displays are tactile hardware devices that raise or lower dot patterns on command from a computer, resulting in a dynamically changing line of Braille. They are the primary means of computer access for deaf-blind users (NCAM 2003b).

Input Devices

- Speech recognition software, coupled with an input device such as a microphone, allows a user to issue commands that an application can recognise and act upon (Paciello 2000).

- Head-pointing devices and eye trackers allow a user to move the cursor on the screen just by moving their head or eyes (Paciello 2000).

- Adaptive keyboards are designed for users with limited dexterity (Vanderheiden & Zimmermann 2002). Adaptive keyboards may be small for users with limited range of movement, or large for users without fine motor control. They may offer fewer choices for those with learning disabilities, or be one-handed for those who have the use of only one hand (NCAM 2003b). For users that can only use a mouse (or mouse-emulating technology), the keyboard can be displayed on the screen itself, and typing can be replaced by pointing to the letters using a mouth stick, pen or finger (NCAM 2003b). Applications that attempt to interrogate the keyboard directly, bypassing the operating system, are unlikely to be accessible to users with adaptive keyboards (NCAM 2003b).

- Single switches are devices for users with severe physical disabilities and can only execute one or two specific movements to operate a computer. It operates in conjunction with scanning software. When the desired option is highlighted during scanning, the user triggers the switch to select it (NCAM 2003b).

7.2 Creation of Interface:

General Considerations:

- Despite the inherent differences between traditional print media and interactive graphical user interfaces, many of the techniques developed for the former, can be applied to the latter.
- The focus for GUIs is on optimizing the static displays that interactive systems are based on. Although mastery of graphic design remains firmly in the domain of graphic designers, the basic principles are not difficult to understand, and can result in noticeable improvement to real-world software development (Mullet & Sano 1995).

- There are two main ways in which GUIs are developed today: using GUI toolkits (such as GTK and Java Swing), and through marked-up web-based applications. The design restrictions imposed by existing GUI toolkits are often a major constraint in designing effective communication-oriented interfaces, and may be one of the triggers for customer preferences shifting toward web-based applications.
- However, the techniques outlined below are general enough to be able to be used in designing any GUI, regardless of implementation.
- These techniques are taken from Mullet & Sano's (1995) definitive book, "Designing Visual Interfaces". It incorporates well-known graphic design techniques and applies them specifically to the graphical user interfaces commonly used today.

Elegance and Simplicity

- Communication is enhanced by carefully selecting the elements to be included and emphasized, and stripping away unnecessary and distracting detail. Significant elements then need to be presented in a manner that makes them easily accessible to the user. Simple, elegant solutions show an intimate understanding of the problem and an ability to ensure that its essence is also grasped by the user. Simple designs provide both aesthetic and functional benefits (Mullet & Sano 1995):
- **Approachability.** Simple designs can be rapidly understood and thus support immediate use, or encourage further exploration.
- **Recognisability. Simple designs present less visual information and are therefore more easily assimilated, understood, and remembered, than more elaborate designs.**
- **Immediacy.** Simple designs can be immediately recognized and understood with minimal conscious effort, and therefore have greater impact than complex designs for precisely this reason.
- **Usability.** Simple designs that remove unnecessary variation or detail, make the element that remains more important and informative. It is nearly impossible to operate a simple design incorrectly.

7.3 Create Meaningful Graphics, Icons and Images

Icons

Icons are most often used to represent objects and actions with which users can interact with or that they can manipulate

Kinds of Icons

Icons fall into these categories by Marcus:

- **Icon.** Something that looks like what it means.
- **Index.** A sign that was caused by the thing to which it refers.
- **Symbol.** A sign that may be completely arbitrary in appearance.

An expanded definition by Roger's icon kinds are

- **Resemblance—An image that looks like what it means. a book, for example , to represent a dictionary**
- **Symbolic**—An abstract image representing something. A cracked glass, for example, can represent something fragile
- **Exemplar**—An image illustrating an example or characteristic of something. a knife and fork has come to indicate a restaurant
- **Arbitrary**—An image completely arbitrary in appearance whose meaning must be learned.
- **Analogy**—An image physically or semantically associated with something. a wheelbarrow full of bricks for the move command

7.4 Perceptual Organisation and Visual Structure

- Organisation and visual structure provide the user with the visual pathways needed to experience a product in a systematic way. Without a coherent visual structure, a design becomes impossible to interpret and understand, resulting in loss of function as well as diminished aesthetic.

- The eye seeks to impose its own organisation onto a design whose structure is not immediately obvious. The designer thus loses control of the message, and its subsequent communication (Mullet & Sano 1995).

- Organisation and visual structure are based on reliable methods that can be repeatedly applied to achieve predictable results**. Organisation begins with classifying related elements into groups and establishing a hierarchy for both elements and groups.** When this hierarchy is finalised, the interface itself can be structured to reflect the

relationships between the elements and maintain a balanced design (Mullet & Sano 1995).

7.5 Printed and online (web pages) facilities:

- ✓ **Page size:** Printed pages are generally larger than their Web counterparts. They are also fixed in size, not variable like Web pages. The visual impact of the printed page is maintained in hard-copy form, while on the Web all that usually exists are snapshots of page areas. The visual impact of a Web page is substantially degraded, and the user may never see some parts of the page because their existence is not known or require scrolling to bring into view. The design implications: the top of a Web page is its most important element, and signals to the user must always be provided that parts of a page lie below the surface.
- ✓ **Page rendering:** Printed pages are immensely superior to Web pages in rendering. Printed pages are presented as complete entities, and their entire contents are available for reading or review immediately upon appearance. Web pages elements are often rendered slowly, depending upon things like line transmission speeds and page content. Design implications: Provide page content that downloads fast, and give people elements to read immediately so the sense of passing time is diminished.
- ✓ **Page layout:** With the printed page, layout is precise with much attention given to it. With Web pages layout is more of an approximation, being negatively influenced by deficiencies in design toolkits and the characteristics of the user's browser and hardware, particularly screen sizes. Design implication: Understand the restrictions and design for the most common user tools.
- ✓ **Page resolution: the resolution of displayed print characters still exceeds that of screen characters, and screen reading is still slower than reading from a document. Design implication: Provide an easy way to print long Web documents.**
- ✓ **Page navigation:** Navigating printed materials is as simple as page turning. Navigating the Web requires innumerable decisions concerning which of many possible links should be followed. Design implications are similar to the above—provide overviews of information organization schemes and clear descriptions of where links lead.

7.6 Conclusion:

Printed page design involves letting the eyes traverse static information, selectively looking at information and using spatial combinations to make page elements enhance and explain each other. Web design involves letting the hands move the information (scrolling, pointing, expanding, clicking, and so on) in conjunction with the eyes.Because moving between Web pages is so easy, and almost any page in a site can be accessed from anywhere else, pages must be made freestanding. Every page is independent. Printed pages, being sequential, fairly standardized in organization, and providing a clear sense of place, are not considered independent. Design implication: Provide informative headers and footers on each Web page.

References

- Paciello, M. (2000) Web Accessibility for People with Disabilities. CMP Books, Lawrence
- Kevin Mullet and Darrell Sano. Designing Visual Interfaces: Communication Oriented Techniques. Prentice Hall, 1995.

CHAPTER 8

ANALYSIS FOR DESIGN AND DEVELOPMENT PHASES IN USER INTERFACE CREATION FOR COMPUTATIONAL LOGICS

Ms. Jimma
Assistant Professor in Computer Science

8.0 Introduction : Design Development Process:

- To know the characteristics of Human Beings
- To understand human considerations and common usability problems in interface
- To understand the methods to analyze business requirements
- To get knowledge about design standards and style guidelines

8.1 Background Information:

Obstacles and Pitfalls in the Development Path

- Gould (1988) has made these general observations about design:
  - Nobody ever gets it right the first time.
  - Development is chock-full of surprises.
  - Good design requires living in a sea of changes.
  - Making contracts to ignore change will never eliminate the need for change.
  - Even if you have made the best system humanly possible, people will still make mistakes when using it.
  - Designers need good tools.
  - You must have behavioral design goals like performance design goals.

The first five conditions listed will occur naturally because people are people, both as users and as developers. These kinds of behavior must be understood and accepted in design. User mistakes, while they will always occur, can be reduced [1] [2].

Pitfalls in the design process exist because of a flawed design process, including a failure to address critical design issues, an improper focus of attention, or development team organization failures. Common pitfalls are:

- No early analysis and understanding of the user's needs and expectations.
- A focus on using design features or components that are "neat" or "glitzy."
- Little or no creation of design element prototypes.

- No usability testing.
- No common design team vision of user interface design goals.
- Poor communication between members of the development team.

8.2 Designing for People: The Five Commandments

The complexity of a graphical or Web interface will always magnify any problems that do occur. Pitfalls can be eliminated if the following design commandments remain foremost in the designer's mind [3] [4] [5].

- Gain a complete understanding of users and their tasks: The users are the customers. Today, people expect a level of design sophistication from all interfaces, including Web sites. The product, system or Web site must be geared to people's needs, not those of the developers.

- Solicit early and ongoing user involvement: Involving the users in design from the beginning provides a direct conduit to the knowledge they possess about jobs, tasks, and needs. Involvement also allows the developer to confront a person's resistance to change, a common human trait. People dislike change for a variety of reasons, among them fear of the unknown and lack of identification with the system.

- Perform rapid prototyping and testing: **Prototyping and testing the product will quickly identify problems and allow you to develop solutions.** Prototyping and testing must be continually performed during all stages of development to uncover all potential defects. If thorough testing is not performed before product release, the testing will occur in the user's office. Encountering a series of problems early in system use will create a negative first impression in the customer's mind, and this may harden quickly, creating attitudes that may be difficult to change. It is also much harder and more costly to fix a product after its release.

- Modify and iterate the design as much as necessary: While design will proceed through a series of stages, problems detected in one stage may force the developer to revisit a previous stage.. Establish user performance and acceptance criteria and continue testing and modifying until all design goals are met.
- Integrate the design of all the system components: The software, the documentation, the help function, and training needs are all important elements of

a graphical system or Web site and all should be developed concurrently. Time will also exist for design trade-offs to be thought out more carefully.

The Design Team

- ✓ Provide a balanced design team, including specialists in:
    - Development
    - Human factors
    - Visual design
    - Usability assessment
    - Documentation
    - Training

- ✓ ***Know your user or client***

- ✓ To create a truly usable system, the designer must always do the following:
    - Understand how people interact with computers.
    - Understand the human characteristics important in design.
    - Identify the user's level of knowledge and experience.
    - Identify the characteristics of the user's needs, tasks, and jobs.
    - Identify the user's psychological characteristics.
    - Identify the user's physical characteristics.
    - Employ recommended methods for gaining understanding of users.

8.3 Conclusion:

What makes a system difficult to use in the eyes of its user? Listed below are several contributing factors that apply to traditional business systems and conclude with following points;

- **Use of jargon.**
- **Non-obvious design.**
- **Non-obvious design.**
- **Disparity in problem-solving strategies.**
- **Design inconsistency.**

References

1. Nielsen J. Usability 101: Introduction to Usability [online]. Warm Springs Blvd. Fremont, CA: Nielsen Norman Group; January 2012. URL: http://www.nngroup.com/articles/usability-101-introduction-to-usability. Accessed 7 April 2013.

2. Learning Technologies at Virginia Tech. The Elements of Interface Design [online]. Blacksburg, VA: designs shop lessons in effective teaching; April 2011. URL: http://www.edtech.vt.edu/edtech/id/interface/index.html. Accessed 7 April 2013.

3. Parr B. 7 Useful Tools for Web Development Testing [online]. NY: Mashable; March 2009. URL: http://mashable.com/2009/03/21/tools-web-testing. Accessed 7 April 2013.

4. Young S. User Interface Design With Markup [online]. Cambridge, UK: Machine Intelligence Laboratory Cambridge University Department of Engineering; January 2009. URL: http://mi.eng.cam.ac.uk/~sjy/3F6/web9.pdf. Accessed 7 April 2013.

5. MSDN Microsoft. Chapter 4: Design and Layout [online]. Redmond, WA: MSDN; 2013. URL: http://msdn.microsoft.com/en-us/library/hh404087.aspx. Accessed 7 April 2013.

CHAPTER 9

SOFTWARE TOOLS: USER AND TASK ANALYSIS BY USING A PROBABILITY MECHANISM IN COMPUTATIONAL LOGIC

Ms.Veena
Assistant Professor & Head in Mathematics

9.0 Introduction: Task analysis is especially valuable in the context of human-computer interaction (HCI). User interfaces must be specified at an extremely low level (e.g. in terms of particular interaction styles and widgets), while still mapping effectively to users' high-level tasks. Computer interfaces are often highly inflexible (when compared to interacting with a physical environment or another person). This inflexibility magnifies the impact of interface design problems, making the close integration of task structure and interface support especially crucial.

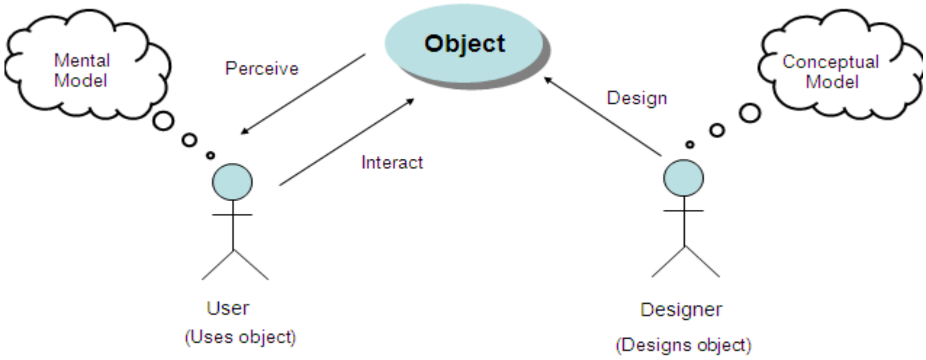


Fig 1.0 The Design process

	Technique	Efficiency	Effectiveness
Technical	HTA	▪ Decomposes complex tasks into subtasks ▪ Complex activities demand extensive hierarchy construction/charting	▪ Improves problem diagnosis and useful for concurrent operations ▪ Does not account for system dynamics
	GOMS	▪ Requires detailed analysis of keystroke level interaction	▪ Improves productivity ▪ Not applicable to broader problems ▪ Ignores contextual factors
Conceptual	CTA	▪ Defines a coherent knowledge representation for the domain being studied ▪ Requires deep engagement with a particular knowledge domain	▪ Increases the understanding of cognitive aspects of the task ▪ Captures task expertise ▪ Fails to fully incorporate learning, contextual and historical factors
Work-Process	Activity Theory	▪ Analyzes the activity, not the task, implying a potentially great increase in scope and complexity ▪ Requires near-ethnographic knowledge of culture	▪ Accounts for learning effects ▪ Extends scope of technology ▪ Requires a high level of abstraction ▪ No disciplined set of methods ▪ Difficult to apply systematically

Fig 1.1 Task Analysis

The required software tools are any web related graphical languages or packages. The terminologies are: **HTA- Hierarchical Task Analysis,** CTA-Cognitive Task Analysis and GOMS models tasks in terms of a set of **G**oals, a set of **O**perators, a set of **M**ethods for achieving the goals, and a set of **S**election rules for choosing among competing Methods for goals. A "set of goals" is defined as a symbolic structure that defines a state of affairs to be achieved and determines a set of possible methods for achieving it.

Operators are defined as elementary perceptual, motor or cognitive acts whose execution is necessary to change any aspect of the user's mental state or to affect the task environment. A method is defined as a description of a procedure for accomplishing a goal, and is one of the ways that users store their task knowledge. Methods are learned procedures that the user already has and are not created during a task performance.

The selection rules in a GOMS task analysis determine how a user selects a particular method, and can be used to predict which method the user will select on the basis of knowledge of the task environment.

9.1 Multi Modal Interfaces:

- ✓ Multi-modal interfaces attempt to address the problems associated with purely auditory and purely visual interfaces by providing a more immersive environment for human-computer interaction.

- ✓ A multi-modal interactive system is one that relies on the use of multiple human communication channels to manipulate the computer. These communication channels translate to a computer's input and output devices. A genuine multi-modal system relies on simultaneous use of multiple communication channels for both input and output, which more closely resembles the way in which humans process information.

- ✓ In the field of psychology, Gestalt Theory is used to describe a relationship where the whole is something other than the sum of its parts. This theory has recently been used to describe a new paradigm for human-computer interaction, where the interface reacts to and perceives the desires of the user via the user's emotions and gestures (Marriott & Beard 2004). This paradigm is called the gestalt User Interface (gUI) and paves the way for a truly personalised user experience.

- ✓

Another product that makes use of multi-modal interfaces is Avatar-Conference, an alternative to video-conferencing that uses avatars to represent the conference participants in a virtual environment. Although it does not incorporate dynamically adjusting modules, it nevertheless provides more than one mode of user interaction.

9.2 Conclusion:

Errors are a symptom of problems. The magnitude of errors in a computer-based system has been found to be as high as 46 percent for commands, tasks, or transactions. Errors, and other problems that befuddle one, lead to a variety of psychological and physical user responses.

- ✓ Psychological
    - Confusion.
    - Annoyance.
    - Frustration.
    - Panic or stress.
    - Boredom.

- ✓ Physical
    - Abandonment of the system.
    - Partial use of the system.
    - Indirect use of the system.
    - Modification of the task.
    - Compensatory activity.
    - Misuse of the system.
    - Direct programming.

References

- [BRE1] Breslow N E, Day N E (1980) Statistical Methods in Cancer Research: Volume 1 — The Analysis of Case-Control studies. IARC Scientific Publications No.32, World Health Organization, IARC Lyon
- [BRE2] Breslow N E, Day N E (1987) Statistical Methods in Cancer Research: Volume 2 — The Design and Analysis of Cohort Studies. IARC Scientific Publications No.82, World Health Organization, IARC Lyon

CHAPTER 10

INFORMATION VISUALIZATION IN USER INTERFACES FOR COMPUTATIONAL LOGICS

Ms. Midhu Vasudevan
Assistant Professor in Physics

10.0 Introduction:

A document table of contents can be presented in a window. A chapter or topic selected from this window can be simultaneously displayed in more detail in an adjoining window.

Presentation of Multiple Kinds of Information: Variable information needed to complete a task can be displayed simultaneously in adjacent windows. For example in one window billing can be done and in one window stock maintenance can be done at the same time using windows. Significant windows could remain displayed so that details may be modified as needed prior

Sequential Presentation of Levels or Kinds of Information: Steps to accomplish a task can be sequentially presented through windows. Key windows may remain displayed, but others appear and disappear as necessary. **This sequential preparation is especially useful if the information-collection process leads down various paths.**

Access to Different Sources of Information: Independent sources of information may have to be accessed at the same time. Independent sources of information may have to be accessed at the same time

Combining Multiple Sources of Information: Text from several documents may have to be reviewed and combined into one. **Pertinent information is selected from one window and copied into another.**

Performing More Than One Task: While waiting for a long, complex procedure to finish, another can be performed. Tasks of higher priority can interrupt less important ones and then the interrupted tasks can be preceded.

Reminding: It can be used to provide remainder through messages or popup or menus.

Monitoring: Data in one window can be modified and its effect on data in another window can be studied.

Multiple Representations of the Same Task: the same task can be represented in two different ways in two windows. For example a report can be given as table in one window and as a chart in another window.

10.1 Information Visualization:

Guidelines for the use of information in the aspect of visualization:

1. **Font style**. Using both upper and lower case characters are more legible than all uppercase characters. Italic text is difficult to read due to inadequate screen resolution or poor font quality (Paciello 2000) and underlines also reduce text legibility (RNIB 2004).
2. **Font size**. Whilst much visual impairment requires fonts to be larger, some require font sizes to be smaller. It is important to allow for customizable font sizes in an application. At larger print sizes, most visually impaired users benefit from having white or yellow print on a dark matt background. However, at small print sizes it is better to use black print on a white background (RNIB 2004).
3. **Text leading**. Spacing between lines of text should be 25-30% of the point size. Many people with partial sight have difficulty finding the beginning of the next line (Arditi 1999b).
4. **Letter spacing**. Condensed fonts are less legible than widely spaced fonts. Mono spaced fonts e.g. `Courier` are also more legible than proportionally spaced fonts e.g. Arial (Arditi 1999b).

5. **Background**. Patterned backgrounds make text more difficult to read.
6. **Moving text**. Flashing text attracts attention but can be hard to read. If this is used, the text could flash and few times then stop. Moving text also creates significant problems for people with low vision. (RNIB 2004).
7. **Justification**. Left-justified text is easier to read than centered text (RNIB 2004).
8. **Chromostereopsis**. Be aware of differences in depth perception if using coloured fonts. Colours appear in the following order, nearest to furthest: red, orange, yellow, green, blue, purple (Minasi 1994).

10.2 Colour

- Colour should never be used as the sole means of conveying important information. However, colour is an important element in graphic design and careful colour selection can also enhance accessibility.

- For people with colour deficits, the ability to distinguish between colours on the basis of hue, lightness and saturation is diminished (Arditi 1999a). RNIB (2004) recommends that no more than five colours should be used in any display.

- Redundancy should enable the controls to be inferred through other means that would benefit people with decreased colour perception.

- **Chromo stereopsis, is the false sense of depth perceived between different colours.** It occurs due to the differences in where light of different wavelengths is focused on the retina. Green light focuses on the retina itself, whereas blue light focuses in front of the retina and red light focuses behind the retina (Minasi 1994).

- Blue and red presented together against a dark background has an almost 3D effect, meaning that red text against a blue background looks jarring, and should be avoided. Colour-blindness and other visual impairments do not affect chromostereopsis, because it is determined by the geometry of light focusing on the retina (Hastletine 2000). The effects of chromostereopsis are magnified on a computer screen.

There are a number of cross-cultural elements that need to be considered by the interface designer, and Nielsen (1996) lists three areas of international user interface concerns:

- ✓ A computer must be capable of displaying a user's native language, character set and notations (such as currency and time).
- ✓ The user interface and documentation must be translated into the user's native language in a way that is understandable and usable.
- ✓ A system must match the user's cultural characteristics, including accommodating the way business is conducted and the way people communicate.

10.3 Conclusion:

It is important, therefore, to design an international interface that can appropriately convey information to a variety of cultures, without confusing, offending, or discriminating against any one culture. To go into the nuances of the cultural meanings of specific images, symbols and colors is beyond the scope of this project, but two other important interface design considerations will be addressed here: data and number formats, and date and time formats.

References:

https://dspace.mit.edu/bitstream/handle/1721.1/35275/6-170Fall- 01/NR/rdonlyres/Electrical-Engineering-and-Computer-Science/6-170Laboratory-in-Software engineeringFall2001/BD7247F9-DD02-42D2-B8E9-75FF01E4F868/0/lecture01.pdf

CHAPTER 11

ANALYSIS FOR SELECTION CONTROL MECHANISM IN HUMAN MACHINE INTERACTION INTERFACE FOR COMPUTATIONAL MECHANISM

Ms.Rajeshwari
Assistant Professor in Mathematics

11.0 Introduction: A selection control presents on the screen all the possible alternatives, conditions, or choices that may exist for an entity, property, or value. The relevant item or items are selected from those displayed. Selection controls include radio buttons, check boxes, list boxes, drop-down/pop-up list boxes, and palettes.

Radio Buttons

- Description:
  — A two-part control consisting of the following:
    • Small circles, diamonds, or rectangles.
    • Choice descriptions.
  — When a choice is selected:
    • The option is highlighted.
    • Any existing choice is automatically un highlighted and deselected.
- Purpose:
  — To set one item from a small set of mutually exclusive options (2 to 8).
- Advantages:
  — Easy-to-access choices.
  — Easy-to-compare choices.
  — Preferred by users.
- Disadvantages:
  — Consume screen space.
  — Limited number of choices.
- Proper usage:
  — For setting attributes, properties, or values.
  — For mutually exclusive choices (that is, only one can be selected).
  — Where adequate screen space is available.

— Most useful for data and choices that are:

• Discrete.

• Small and fixed in number.

• Not easily remembered.

• In need of a textual description to meaningfully describe the alternatives.

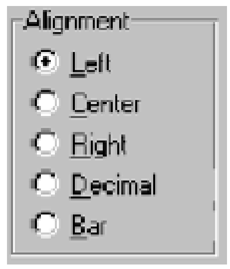
• Most easily understood when the alternatives can be seen together and compared to one another.

• Never changed in content.

— Do not use:

• For commands.

• Singly to indicate the presence or absence of a state.



11.1 Choice Descriptions

- Provide meaningful, fully spelled-out choice descriptions clearly describing the values or effects set by the radio buttons.
- Display in a single line of text.
- Display using mixed-case letters, using the sentence style.
- Position descriptions to the right of the button. Separate them by at least one space from the button.
- When a choice is conditionally unavailable for selection, display the choice description grayed out or dimmed.
- Include a none choice if it adds clarity.

Size

- Show a minimum of two choices, a maximum of eight.

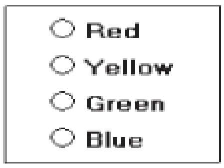
Defaults

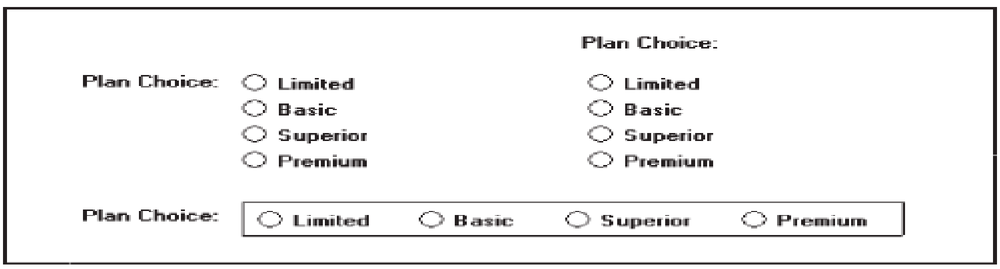
- When the control possesses a state or affect that has been predetermined to have a higher probability of selection than the others, designate it as the default and display its button filled in.
- When the control includes choices whose states cannot be predetermined, display all the buttons without setting a dot, or in the *indeterminate* state.
- When a multiple selection includes choices whose states vary, display the buttons in another unique manner, or in the *mixed value* state.

Structure

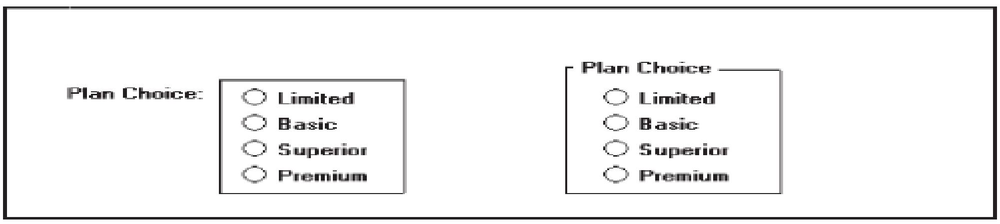
- A columnar orientation is the preferred manner of presentation.
- Left-align the buttons and choice descriptions.
- If vertical space on the screen is limited, orient the buttons horizontally.
- Provide adequate separation between choices so that the buttons are associated with the proper description.

  — A distance equal to three spaces is usually sufficient.
- Enclose the buttons in a border to visually strengthen the relationship they possess.





Still Better



Best

11.2 Conclusion:

Arrange selections in expected order or follow other patterns such as frequency of occurrence, sequence of use, or importance.

— For selections arrayed top to bottom, begin ordering at the top.

— For selections arrayed left to right, begin ordering at the left.

If, under certain conditions, a choice is not available, display it subdued or less brightly than the available choices.

References

[1] https://info.sice.indiana.edu/~hrosenba/S510/classes/hci_intro/hci_intro.pdf

CHAPTER 12

PRESENTATION STYLE FOR USER INTERFACES IN COMPUTATIONAL ENVIRONMENT – AN OVERVIEW

Mr.Vibin
Assistant Professor in Mathematics

12.0 Introduction:

Position any control related to a radio button immediately to the right of the choice description. If the radio button choice description also acts as the label for the control that follows it, end the label with an arrow (>).

Captions

- Structure:

  — Provide a caption for each radio button control.

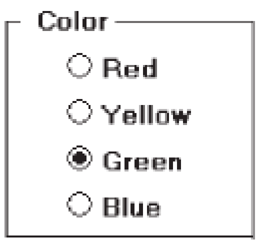
  • Exception: In screens containing only one radio button control, the screen title may serve as the caption.
- Display:

  — Fully spelled out.

  — In mixed-case letters, capitalizing the first letter of all significant words.
- Columnar orientation:

  — With a control border, position the caption:

  • Upper-left-justified within the border.



• Alternately, the caption may be located to the left of the topmost choice description.

— Without an enclosing control border, position the caption:

• Left-justified above the choice descriptions, separated by one space line.

• Alternately, the caption may be located to the left of the topmost choice description.

- Horizontal orientation:

— Position the caption to the left of the choice descriptions.

• Alternately, with an enclosing control border, left-justified within the border.

— Be consistent in caption style and orientation within a screen.

12.1 Check Boxes

- Description:

— A two-part control consisting of a square box and choice description.

— Each option acts as a switch and can be either “on” or “off.”

• When an option is selected (on), a mark such as an “X” or “check” appears within the square box, or the box is highlighted in some other manner.

• Otherwise the square box is unselected or empty (off).

— Each box can be:

• Switched on or off independently.

• Used alone or grouped in sets.

- Purpose:

— To set one or more options as either on or off.

- Advantages

— Easy-to-access choices.

— Easy-to-compare choices.

— Preferred by users.

- Disadvantages:

— Consume screen space.

— Limited number of choices.

— Single check boxes difficult to align with other screen controls.

- Proper usage:

— For setting attributes, properties, or values.

— For nonexclusive choices (that is, more than one can be selected).

— Where adequate screen space is available.

— Most useful for data and choices that are:

• Discrete.

• Small and fixed in number.

• Not easily remembered.

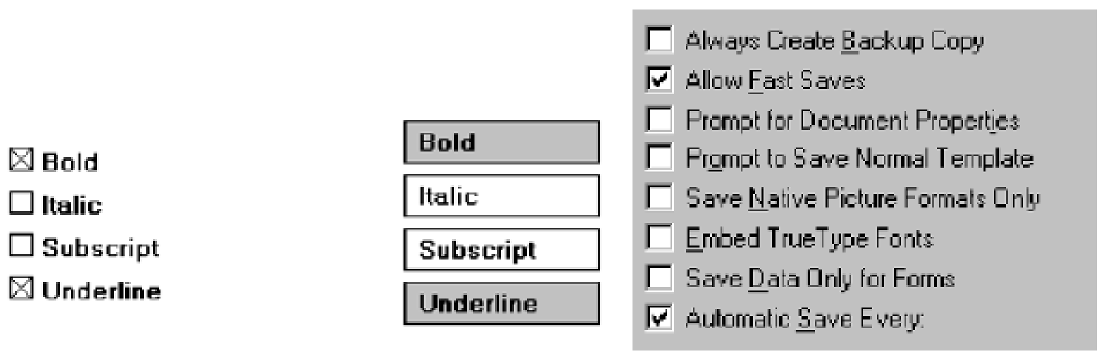
• In need of a textual description to describe meaningfully.

• Most easily understood when the alternatives can be seen together and compared to one another.

• Never changed in content.

— Can be used to affect other controls.

— Use only when both states of a choice are clearly opposite and unambiguous.



12.2 Selection Method and Indication

- Pointing:

  — Highlight the selection choice in some visually distinctive way when the pointer or cursor is resting on it and the choice is available for selection.
- Selection:

  — Use a reverse video or reverse color bar to surround the choice description when it is selected.

  — The cursor should be as wide as the box itself.

  — Mark the selected choice in a distinguishing way.
- Activation:

  — Require the pressing of a command button when an item, or items, is selected.

Screen Presentation

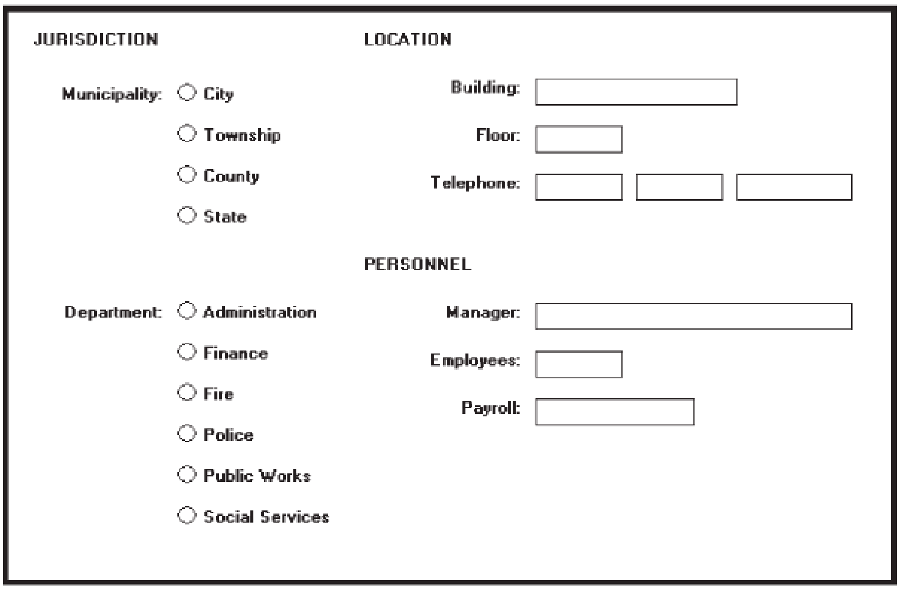
- Follow all relevant general guidelines for screen design.
- Limit the number of symbols to 12, if possible, and at most 20.
- Arrange icons:

  — In a meaningful way, reflecting the organization of the real world.

  — To facilitate visual scanning.

  — Consistently.
- Place object and action icons in different groups.

  Permit the user to choose between iconic and text display of objects and actions.



12.3 Conclusion:

Groupings can be further enhanced through the use of borders. Inscribe line borders around elements of a single control such as a radio button or check box and/or groups of related controls or fields. Individual control borders should be visually differentiable from borders delineating groupings of fields or controls. Provide a border consisting of a thin line around single controls and a slightly thicker line around groups of fields or controls.

References

[1] https://www.cl.cam.ac.uk/teaching/1011/HCI/HCI2010.pdf

978-93-5473-511-0